# JET-COOLED INFRARED LASER SPECTROSCOPY IN THE UMBRELLA $\nu_2$ VIBRATION REGION OF $NH_3$: IMPROVING THE POTENTIAL ENERGY SURFACE MODEL OF THE $NH_3 - Ar$ VAN DER WAALS COMPLEX

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Taking advantage of our sensitive laser spectrometer coupled to a pulsed slit jet[b] we recorded near the $\nu_2$ vibration a series of rovibrational transitions of the $NH_3 - Ar$ van der Waals (vdW) complex. These transitions involve in the ground vibrational state several internal rotor states corresponding to the ortho$NH_3$ and para$NH_3$ spin modifications of the complex. They are labeled by $\Sigma_a$(j,k), $\Sigma_s$(j,k), $\Pi_a$(j,k) and $\Pi_s$(j,k) where $\Sigma$(K=0) and $\Pi$(K=1) indicate the projection K of the total rotational angular momentum J on the vdW axis, the superscripts s and a designate a symmetric or antisymmetric $NH_3$ inversion wave function, and j, k quantum numbers indicate the correlation between the internal-rotor state of the complex and the j, k rotational state of the free $NH_3$ monomer. Five bands have been identified, only one of which was partly observed before[c]. They include transitions starting from the $\Sigma_a$(j=0 or j=1) state without any internal angular momentum, consequently they can be assigned from the band contour of a linear-molecule-like K=0, $\Delta$J=1 transition. The energies and splittings of the rovibrational levels of the $\nu_2 = 1\leftarrow 0$ spectrum derived from the analysis of the $\Pi_s$, $\Sigma_s$(j=1)$\leftarrow$ $\Sigma_a$(j=0), k=0 bands and mostly of the $\Sigma_s$, $\Pi_s$ and $\Sigma_a$(j=1)$\leftarrow\Sigma_a$(j=1), k=1 bands bring relevant information about the $\nu_2$ dependence of the $NH_3 - Ar$ interaction, the rovibrational dynamics of the $NH_3 - Ar$ complex and provide a sensitive test of a recently developed 4D potential energy surface that includes explicitly its dependence on the umbrella motion[d].

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